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LABORATORY TESTS WITH CANDIDATE TOXICANTS AGAINST THE GYPSY MOTH II

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INTRODUCTION

Gypsy moth, *Porthetria dispar* (L.), caterpillars defoliated about 1,774,000 acres of woodland in nine northeastern states during 1973 (*8*).[2] Survey traps also captured numbers of adult moths at many locations outside the quarantined area. As this destructive insect continues its thrust to the south and west it becomes increasingly more apparent that we need modern tools and techniques to work with in our fight against this pest.

The main tool in our arsenal is insecticide. As early as 1891 investigators were experimenting with Paris green, London purple, arsenate of lead and arsenate of soda (*4*). During World War II several thousand materials and hundreds of formulations were studied for the purpose of developing control measures for certain insects of importance to the armed forces (*1*). Today with the world population concerned about environmental pollution it becomes increasingly more important that we have active screening programs so the safest and most effective insecticides will be available for insect control.

This publication is the second in a series and presents a number of candidate insecticides that have been tested in the laboratory against second instar gypsy moth larvae (*6*). The epidermal test method was used in all experiments.

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[2]Numbers in parentheses refer to References Cited, page 2.

PROCEDURES

All gypsy moth larvae used in this study were reared in the laboratory on an artificial diet similar to that described by Leonard and Doane (*5*). Larvae were newly moulted and hand picked.

Chemicals were mixed prior to testing and were stored in sealed vials under refrigeration when not in use. Dosage-mortality data were obtained by application of one microliter of acetone containing the insecticides to the dorsal metathoracic region (*2*). This was done using a 50-microliter syringe and repeating dispenser calibrated to deliver 1/50th of its capacity at each push of the button (*7*). Dosage-mortality curves were obtained by treating groups of larvae with 5 dilutions of each insecticide. The highest dose for each was 40 ug/ul/larvae with each dilution one half the concentration of the preceding one. When mortality was too high in the low dilution, lower doses were used and the higher ones omitted.

Minimum numbers of 100 larvae were used to obtain each dosage-mortality curve. In some cases as many as 2,400 were used. Tests consisted of treating 20 larvae with each of the 5 doses and an acetone-treated check. Each test was repeated 5 times or more.

Treated larvae were held in groups of 20 in plastic petri dishes (100 mm x 15 mm) with two-13 mm cubes of artificial diet per dish. Chamber temperature was 26° C. with a relative humidity of 60 percent. Mortality readings were made at the end of 48 hours. Criterion for death was no reaction when larvae were prodded gently with a disecting needle. If any mortality occurred in the check at this time, test was repeated.

The dosage-mortality curves, LD-50's and 90's were computed by probit analysis. This work was done by R.J. Daum (*3*).

REFERENCES CITED

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(*7*) Merriam, W.A. 1967.
Tests with a laboratory low-volume spray device. J. Econ. Entomol. 1967, vol. 60, no. 1: pp. 274-276.

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Table 1.--Epidermal tests

Material	Formulation	LD-50 µg/µl	Upper Limit	Lower Limit	LD-90 µg/µl	Upper Limit	Lower Limit	Slope	Test Animals Observed	Test Animals Responded
Accothion	500E	.31	.80	.11	.90	416.	.48	2.8	600	289
AC-72841	2 lb/gal	5.46	8.42	3.54	10.6	33.7	7.22	4.44	500	236
AC-94556	3F	8.55	11.21	6.84	95.	199.	56.	1.23	600	208
Acephate *	75S	.22	.29	.17	.64	1.14	.46	2.8	1700	956
Baygon	Tech	.12	.13	.10	.34	.41	.29	2.77	600	356
Bay-29493	Tech	2.43	2.75	2.15	8.13	10.1	6.83	2.45	600	353
Bay-37344	Tech	.11	.12	.10	.41	.51	.34	2.24	700	365
Bioethanomethrin*	80%	.0003	.003	.0003	.0006	.0007	.0005	4.05	800	518
Biotrol *	W/P	No significant regression						2.2	300	28
Carbaryl *	80S	.03	.04	.03	.07	.08	.06	4.43	1800	1264
CGA-18809	Tech	.06	.09	.03	.31	.78	.20	1.80	600	463
Cidial	E-4	.10	.15	.06	.74	2.5	.42	1.5	1200	736
Cygon	Tech	5.83	6.45	5.30	24.2	29.8	20.3	2.08	1100	461
DDT *	75% W/P	.34	.45	.25	1.8	3.5	1.2	1.8	2400	1385
Defend	W-25	No significant regression						1.5	300	87
Defend	E-267	.90	1.1	.73	3.7	4.7	3.0	2.1	500	374
Diazinon	50-W	.12	.15	.09	.41	.69	.30	2.4	1600	939
Dichlorvos	Tech	.10	.74	.05	.16	2.9	.08	5.9	500	234
Dimethrin	Tech	.10	.13	.07	.29	.43	.22	2.7	1300	946
Dowco-214	Tech	No significant regression						2.7	1000	770
DPX-1764	80% W/P	.21	.23	.19	.85	.98	.75	2.1	1400	938
Dursban *	Tech	.09	.19	.004	.38	173.	.18	2.0	700	494
Fundal	Tech	No significant regression						-0.0	500	58
Gardona	50 W/P	.15	.16	.14	.31	.34	.28	4.0	1000	517
Gardona *	75 W/P	.08	.10	.05	.20	.38	.14	3.1	1600	1138
Gardona	4 WOL	.22	.28	.18	.48	.78	.36	3.9	1000	396
Herc-16801	4 lb/gal	7.8	9.1	6.9	19.7	27.8	15.6	3.2	500	96
Imidan *	50% W/P	.69	.98	.45	5.8	16.2	3.4	1.4	1900	1110
Lannate	Tech	No significant regression						2.7	1000	770
Leptophos *	2.7 lb/gal	No significant regression						5.7	1400	960
Lethane	4 lb/gal	No significant regression						4.2	400	70

Table 1.--Epidermal tests--Continued

Material	Formulation	LD-50 µg/µl	Upper Limit	Lower Limit	LD-90 µg/µl	Upper Limit	Lower Limit	Slope	Test Animals Observed	Test Animals Responded
Malathion *	Tech	.26	.50	.15	1.1	7.0	.56	2.0	600	273
Matacil	75% W/P	No significant regression						6.8	600	340
Meta Systox-R	50%	.99	1.1	.92	1.6	1.8	1.4	6.2	400	185
Methyl Trithion	25% W/P	3.6	4.1	3.3	7.9	10.2	6.5	3.8	400	101
Mobam	80% W/P	No significant regression						6.0	1900	1366
Monitor	4EC	.07	.16	.05	.11	.34	.07	6.7	900	529
Mon-856	Tech	41.3	1200.	12.8	4487.	13461709.	303.	.63	500	89
MC-4044	Tech	.04	.06	.02	.24	.61	.14	1.6	900	645
MC-9087	Tech	99999.	-	-	-	-	-	.18	1700	116
Neopynamin	Tech	.11	.12	.10	.23	.27	.20	3.9	400	205
Ortho BUX	2E	.04	.07	.01	.13	1.2	.07	2.4	500	345
Ortho-13362	50W	.07	5993.	.04	.11	1568075.	.05	6.7	900	466
Ortho-14040	2E	No significant regression						11.	1100	637
Ortho-15223	60S	No significant regression						3.7	800	427
Oxazolin	Tech	1.3	1.3	1.3	1.3	1.3	1.3	-41.	700	233
Padan	50S	.37	.51	.26	1.4	2.6	.92	2.3	2100	1247
Phosalone	Tech	.39	.52	.28	1.0	1.8	.73	3.1	700	492
Phoxim	Tech	.02	.04	.01	.11	.77	.06	1.9	1200	807
Plantgard	Tech	No significant regression						2.3	900	657
Pyrenone	Tech	.03	.03	.02	.08	.13	.06	2.7	1000	606
Pyrocide 175	20%	.011	.02	.01	.04	.11	.03	2.3	1700	1048
R-15792	Tech	.08	.09	.08	.21	.25	.18	3.3	600	334
R-15996	Tech	1.5	1.9	1.2	3.6	6.5	2.6	3.4	1000	386
R-23680	Tech	No significant regression						4.6	800	183
RH-1170	50 W/P	9.8	18.	6.7	65.	257.	29.	1.6	500	62
Resmethrin	Tech	.004	.01	.000	.05	1.2	.02	1.2	500	424
Resmethrin	ECLXA	.005	.006	.004	.02	.03	.02	1.9	500	336
Resmethrin *	ECXY	.004	.005	.003	.03	.04	.02	1.5	500	343
Resmethrin	EN-1	.01	.02	.009	.06	.08	.05	1.8	800	550
Sevimol	4 lb/gal	No significant regression						6.9	600	431
SD-3342	Tech	.02	.04	.001	.15	.43	.08	1.4	700	637
SD-3342	90%	.11	.16	.07	.64	1.3	.41	1.7	900	687

TH-6040	25% W/P	772.	114294.	126.	225608.	-	6087.	.52	1000	121
TH-6041	10% EC	3.3	4.3	2.6	23.	44.	15.	1.5	1400	629
Torak	6 lb/gal	1.1	1.2	1.0	2.1	2.5	1.9	4.5	500	229
Trichlorfon *	80% S/P	.23	.25	.22	.90	1.0	.82	2.2	2300	1440
Tris Nitro	Tech	17839.	-	1258.	3064430.	-	-	.57	1200	46
XE-30 6E	61.2% B/W	1.2	1.3	1.1	2.2	2.6	1.9	4.4	400	161
XE-269	1.7 lb/gal	.15	.16	.14	.29	.32	.27	4.3	1200	709
XE-272	50 EC	No significant regression						5.9	600	348
XRD-36A	Tech	1.1	1.2	.96	3.9	4.9	3.3	2.1	600	368
Zectran *	1.5 lb/gal	No significant regression						7.9	1200	739
Zolone	25% W/P	.44	.49	.40	1.3	1.5	1.1	2.8	700	454
18739	Tech	.009	.02	.001	.02	.82	.01	3.3	700	389
26021	Tech	.002	.003	.001	.007	.02	.005	2.4	1000	537

* Materials that have been field tested.

Appendix

[Codes: Bt-Bacillus thuringiensis, C-Carbamate, CH-Chlorinated Hydrocarbon, HP-Hydrophilic Polymer, N-Nereistoxin, O-Ovicide, P-Phosphate, PY-Pyrethrin, S-Systemic, SY-Synergist]

Material	Chemical Name	Company	Ent no.	Compound Class	Oral LD-50 Male Rats (mg/kg)
Accothion	0,0-dimethyl 0-4-nitro-m-tolyl phosphorothioate	Cyanimid	25715	P	503.5
AC-72841	Confidential	"	70394	O	1,210
AC-94556	"	"	29052	O	350
Acephate	0,S-Dimethyl acetyl-phosphoramidothioate	Chevron	27822	P	945
Baygon	0,Isopropoxyphenyl methylcarbamate	Chemagro	25671	C	128
Bay-29493	0,0-Dimethyl 0-4-methylthio)-m-tolyl phosphorothioate	"	25540	C	313
Bay-37344	4(methylthio)-3, 5-xylyl methylcarbamate	"	25726	C	130
Bioethanomethrin	Synthetic Pyrethroid	MGK	27985B	PY	100 ± 16
Biotrol	Bacillus thuringiensis	Thompson-Hayward		BT	-
Carbaryl	1-Naphthyl N-methylcarbamate	Union Carbide	23969	C	400
CGA-18809	Confidential	Ciba-Geigy	29129	P	1,180
Cidial	0,0-Dimethyl S-(a-ethoxycarbonylbenzyl) phosphorodithioate	Thompson-Hayward	27386	P	300 - 400
Cygon	0,0-Dimethyl S-(N-methylcarbamoyl methyl) phosphorodithioate	American Cyanamid	24650	P	320 - 380
DDT	1,1,1-trichloro-2, 2-bis (p-chlorophenyl) ethane	City Chem	1506	CH	113
Diazinon	0,0-Diethyl 0-(2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate	Geigy	19507	P	466 ± 87
Dichlorvos	Dimethyl 2,2-dichlorovinyl phosphate	Shell	20738	P	56
Dimethrin	2,4-Dimethylbenzyl-2, 2-dimethyl-3-(2-methyl-propenyl) cyclopropenecarboxylate	MGK	21170	PY	40g/kg

Dowco-214	O-O-dimethyl O-(3,5,6-T richloro-2-pyridyl) phosphorothioate	Dow	27520	P	941
DPX-1764	S-methyl-1-carbamoyl-N-[(methylcarbamoyl) oxy] thioformimidate	DuPont	27817X	C	26
Dursban	0,0-Diethyl 0-(3,5,6-trichloro-2-pyridyl) phosphorothioate	Dow	27311	P	155
Fundal	N-(4-Chloro-o-tolyl)-N,N-dimethyl-formamidine	Nor-Am	27567	O	350
Gardona	2-Chloro-1-(2,4,5-trichlorophenyl) vinyl dimethylphosphate	Shell	25841	P	4,000
Herc-16801	Phenyl N-dimethoxy-phosphinodithioacetyl N-methylcarbamate	Hercules	27954	C	400
Imidan	N-(Mercaptomethyl) phthalimide S-(0,0-dimethylphosphorodithioate)	Stauffer	25705	P	216
Lannate	S-Methyl N-[(methylcarbamoyl) oxy] thioacetimidate	DuPont	27341	C	17
Leptophos	O-(4 Bromo-2,5-dichlorophenyl) O-methyl-phenylphosphonothioate	Velsicol	27378	P	90.5
Lethane	Beta-Butoxy-Thiocyanodiethyl ether	Rohm + Haas	-	-	90
Malathion	0,0-dimethyl phosphorodithicate ester of diethyl mercaptosuccinate	American Cyanamid	17034	P	1,375
Matacil	4-Dimethylamino-m-tolyl methylcarbamate	Chemagro	25784	C	30
Meta Syst@x-TR	0,0-Dimethyl S-[2-(ethylsulfinyl) ethyl] phosphorothioate	"	24964	S	80
Methyl-Trithion	0,0-dimethyl S(((p-Chlorophenyl)thio) methyl) phosphorodithioate	Stauffer	25599	P	200
Mobam	4-Benzothinyl N-methyl carbamate	Rohm + Haas	27041	C	234
Monitor	0,S-dimethyl phosphoramidothioate	Chevron	27396	P	21
Mon-856	Confidential	Monsanto	27824	-	44
MC-4044	"	Mobil	27744	P	310
MC-9087	"	Mobil	-	-	150

Appendix--Continued

Material	Chemical Name	Company	Ent no.	Compound Class	Oral LD-50 Male Rats (mg/kg)
Neopynamin					
Ortho PUX	m-(1-methylbutyl) phenyl methylcarbamate and m-(1-ethylpropyl) phenyl methylcarbamate	Chevron	27127	C	170
Ortho-13362	Confidential	"	-	C	500
Ortho-14040	"	"	-	C	104
Ortho-15223	"	"	-	P	180
Oxazolin	Propanol + Caprylic Acid	Commercial Solvents	-	-	-
Padan	S,S-[2-(Dimethylamino) trimethylene] bis (thiocarbamate)	Chevron	27573	N	250
Phoxim	Phenylglyoxylonitrile oxime 0,0-diethyl phosphorothioate	Chemagro	27448	P	2,875
Plantgard		Polymetrics International	-	HP	-
Pyrenone	Pyrethrins and piperonyl butoxide	Niagara-FMC	-	PY	-
Pyrocide-175	20% ± 0.6 W/W Pyrethrins by AOAC method	MGK	-	PY	820
R-15792	Confidential	Stauffer	27632	P	58
R-15996	"	"	27647	P	79
R-23680	Phenyl-Propynl Ether	"	27947	-	3,160
RH-1170	Confidential	Rohm + Haas	-	P	150
Resmethrin	5-Benzyl-3-furyl methyl-2, 2-dimethyl-3-(2-methylpropenyl) cyclopropane carboxylate	S. B. Pinick	27474	PY	2,500
Sevimol	1-Naphthyl N-methylcarbamate + molasses	Union Carbide	23969	C	400
SD-3342	Confidential	Shell	-	-	-
TH-6040	1-(4-chlorophenyl)-3-(2,6-difluorobenzoyl)-urea	Thompson-Hayward	-	-	±3,160
TH-6041	Confidential	" "	-	-	±3,160
Torak	S-(2,Chloro-1-phthal-imidoethyl) 0,0-diethyl phosphorodithioate	Hercules	27322	P	5 - 71
Trichlorfon	Dimethyl (2,2,2-trichloro-1-hydroxyethyl) phosphonate	Chemagro	19763	P	450

Tris Nitro	[Tris(hydroxymethyl)nitromethane]	Commercial Solvents	-	-	-
XE-30 6E	Confidential	Chevron	-	SY	-
XE-269	"	"	-	C	66
XE-272	"	"	-	P	112
XRD-36A	Wax Emulsion	Mobil	23969	C	850
Zectran	4-Dimethylamine-3,5-xylyl N-methylcarbamate	Dow	25766	C	15 - 62
Zolone	0,0-Diethyl S-(6-chloro benzoxazolone-3-yl-methyl) phosphorodithioate	Rhodia	27163	P	100 - 180
18739	(5-benzyl-3-furyl)methyl(+)-trans-2, 2-dimethyl-3-(2-methyl-1-propenyl) cyclopropane-1-carboxylate	Niagara FMC	27662	PY	8,800 ± 1,900
26021	(5 benzyl-3-(uryl)methyl(+)-CIS-2,2-dimethyl-3-(2-methyl-1-propenyl) cyclopropane-1-carboxylate	" "	27987	PY	86 ± 6